

DWDM 80KM SFP+ TRANSCEIVER

TPD1XGKZRxxG



Product Description

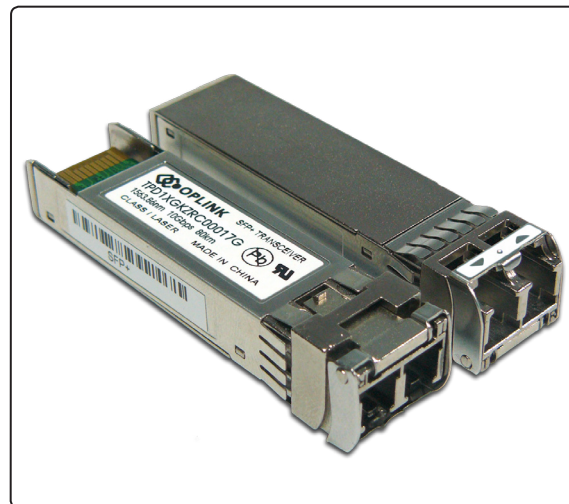
The TPD1XGKZRxxG is an enhanced small form factor pluggable (SFP+) fiber optic transceiver with digital diagnostics monitoring functionality (DDM). Supporting Ethernet and Fiber Channel standards with dense wavelength division multiplexing (DWDM) wavelength makes it ideally suited for high capacity data-com and storage area network applications. DDM functionality (alarm and warning features) is integrated into the design via an I²C serial interface per the Multi-Source Agreement (MSA) SFF-8472, Rev. 10.4.

Each transceiver utilizes an electro absorption modulator integrated laser (EML) with an operating wavelength with 100GHz (0.8nm) spacing per the ITU-grid. The transceiver supports data rates ranging from 11.3Gbps down to 8Gbps. It provides an excellent solution for data transmission at DWDM wavelength over up to 80km single mode fiber. The low power consumption and excellent EMI performance enable system design with high port density. The product is RoHS compliant and is designed and tested in accordance with industry safety standards. The transceiver is Class I Laser product per U.S. FDA/CDRH and international IEC-60825 standards.

The TPD1XGKZRxxG transceiver connects to standard 20-pad SFP+ connectors for hot plug capability. This allows the system designer to make configuration changes or maintenance by simply plugging in different transceivers without removing the power supply from the host system. The transmitter and receiver DATA interfaces are internally AC-coupled. LV-TTL Transmitter Disable control input and Loss of Signal (LOS) output interfaces are also provided.

The transceiver has bail-type latch, which offers an easy and convenient way to release the modules. The latch is compliant with the SFP MSA.

The transceiver operates from a single +3.3V power supply over an operating case temperature range of 5°C to +70°C (commercial), or -5°C to +85°C (extended) or -40°C to +85°C (industrial). The housing is made of metal for EMI immunity.



Features

- Temperature-stabilized DWDM EML transmitter
- Transmission distance up to 80km (SM Fiber)
- Low power consumption
- Wide case operating temperature range
- Compliant to SFP+ Electrical MSA SFF-8431
- Compliant to SFP+ Mechanical MSA SFF-8432
- Digital Diagnostics Monitoring (DDM) through Serial Interface comply with SFF-8472, Rev. 10.4
- RoHS 6/6 compliant
- Laser Class 1 IEC/CDRH compliant

Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units
Storage Temperature Range	T_{ST}	- 40	+ 85	°C
Operating Case Temperature ¹	"Commercial"	- 5	+ 70	°C
	"Extended"	- 5	+ 85	°C
	"Industrial"	- 40	+ 85	°C
Operating Relative Humidity ²	RH	0	85	%
Supply Voltage Range	V_{CC}	- 0.5	+ 3.6	V

¹ Measured on top side of SFP+ module at the front center vent hole of the cage.

² Non condensing

Transmitter Performance Characteristics (Over Operating Case Temperature. $V_{CC} = 3.13$ to $3.47V$)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Data Rate	B	-	10.3125	-	Gb/s
Center Wavelength ¹	λ_C	See Ordering Information Table			nm
Average Optical Output Power	P_{Avg}	0	-	+ 5	dBm
Extinction Ratio	ER	8.2	-	-	dB
Relative Intensity Noise	RIN	-	-	- 128	dB/Hz
Side Mode Suppression Ratio	$SMSR$	30	-	-	dB
Optical Return Loss Tolerance	-	-	-	- 21	dB
Optical Output Eye	<i>Compliant with IEEE 802.3ae</i>				
¹ BOL : $\pm 0.05nm$ from ITU grid; EOL: $\pm 0.1nm$ from ITU grid.					

Receiver Performance Characteristics (Over Operating Case Temperature. $V_{CC} = 3.13$ to $3.47V$)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Data Rate	B	-	10.3125	-	Gb/s
Wavelength of Operation	λ	1530	-	1565	nm
Receiver Sensitivity @ 10.3125Gb/s ¹	P_{min_BB}	-	-	- 23	dBm
Receiver Sensitivity with 80km Fiber@10.3125Gb/s ¹	P_{min_Fiber}	-	-	- 20	dBm
Maximum Input Optical Power (10^{-12} BER)	P_{max}	- 8	-	-	dBm
Receiver Reflectance	-	-	-	- 27	dB
LOS Hysteresis	-	0.5	-	-	dB
LOS Thresholds	Increasing Light Input	P_{los+}	-	- 25	dBm
	Decreasing Light Input	P_{los-}	- 38	-	
¹ Specified with BER $< 1 \times 10^{-12}$ and PRBS 2 ³¹ -1.					

Note: The specified characteristics are met within the recommended range of operation. Unless otherwise noted typical data are quoted at nominal voltage and +25°C ambient temperature.

Laser Safety:

All transceivers are Class I Laser products per FDA/CDRH and IEC-60825 standards. They must be operated under specified operating conditions.



Oplink Communications, Inc.
DATE OF MANUFACTURE:

This product complies with
21 CFR 1040.10 and 1040.11
Meets Class I Laser Safety Requirements

Transmitter Electrical Characteristics (Over Operating Case Temperature. $V_{CC} = 3.13$ to $3.47V$)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Differential Input Impedance	Z_d	-	100	-	Ω
Differential Input Voltage Swing	$V_{PP-DIFF}$	180	-	700	mV
Input HIGH Voltage (TX Disable) ¹	V_{IH}	2.0	-	V_{CC}	V
Input LOW Voltage (TX Disable) ¹	V_{IL}	0	-	0.8	V
Output HIGH Voltage (TX Fault) ²	V_{OH}	2.0	-	$V_{CC} + 0.3$	V
Output LOW Voltage (TX Fault) ²	V_{OL}	0	-	0.8	V

¹ There is an internal 4.7k Ω to 10k Ω pull-up resistor to VccT.
² Open collector compatible, 4.7k Ω to 10k Ω pull-up resistor to Vcc (Host Supply Voltage).

Receiver Electrical Characteristics (Over Operating Case Temperature. $V_{CC} = 3.13$ to $3.47V$)

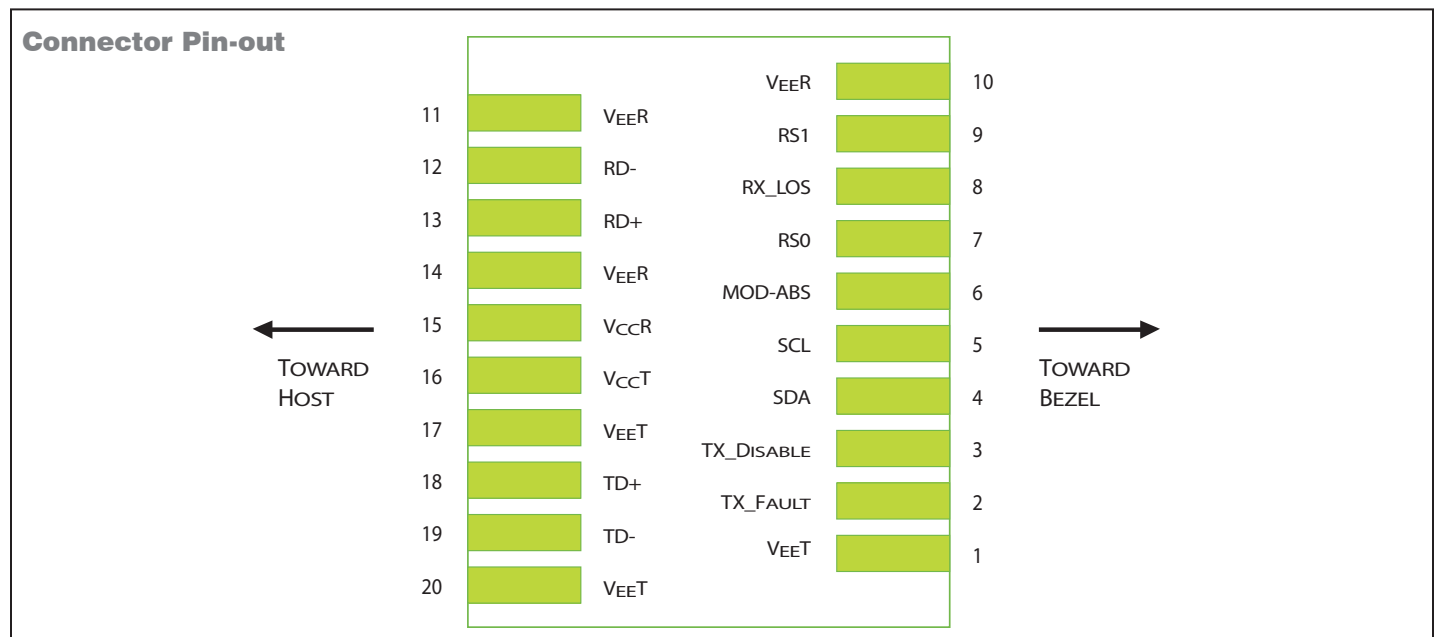
Parameter	Symbol	Minimum	Typical	Maximum	Units
Differential Output Impedance	Z_d	-	100	-	Ω
Differential Output Swing	$V_{PP-DIFF}$	300	-	850	mV
Output Rise and Fall time (20% to 80%)	t_{RH}, t_{FH}	28	-	-	ps
Output HIGH Voltage (LOS) ¹	V_{OH}	$V_{CC} - 1.3$	-	$V_{CC} + 0.3$	V
Output LOW Voltage (LOS) ¹	V_{OL}	0	-	0.8	V

¹ Open collector compatible, 4.7k Ω to 10k Ω pull-up resistor to Vcc (Host Supply Voltage).

Electrical Power Supply Characteristics (Over Operating Case Temperature. $V_{CC} = 3.13$ to $3.47V$)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Power Supply Voltage	V_{CC}	3.13	3.30	3.47	V
DC Common Mode Voltage	V_{CM}	0	-	3.60	V
Supply Current	I_{VCC}	-	365	-	mA
Power Consumption	C-temp	P_W	-	1.2	1.8
	E/I-temp				2.1

Note: The specified characteristics are met within the recommended range of operation. Unless otherwise noted typical data are quoted at nominal voltage and +25°C ambient temperature.



Module Pin Description

Pin	Logic	Symbol	Description
1	-	<i>VeeT</i>	Module Transmitter Ground
2	<i>LVTTTL-O</i>	<i>TX_Fault</i>	Module Transmitter Fault
3	<i>LVTTTL-I</i>	<i>TX_Disable</i>	Transmitter Disable; Turns off transmitter laser output
4	<i>LVTTTL-I/O</i>	<i>SDA</i>	2-Wire Serial Interface Data Line
5	<i>LVTTTL-I/O</i>	<i>SCL</i>	2-Wire Serial Interface Clock
6	-	<i>MOD-ABS</i>	Module Definition, Grounded in the module
7	<i>LVTTTL-I</i>	<i>RS0</i>	No function implemented
8	<i>LVTTTL-O</i>	<i>RX_LOS</i>	Receiver Loss of Signal Indication
9	<i>LVTTTL-I</i>	<i>RS1</i>	No function implemented
10	-	<i>VeeR</i>	Module Receiver Ground
11	-	<i>VeeR</i>	Module Receiver Ground
12	<i>CML-O</i>	<i>RD-</i>	Receiver Inverted Data Output
13	<i>CML-O</i>	<i>RD+</i>	Receiver Data Output
14	-	<i>VeeR</i>	Module Receiver Ground
15	-	<i>VccR</i>	Module Receiver 3.3V Supply
16	-	<i>VccT</i>	Module Transmitter 3.3V Supply
17	-	<i>VeeT</i>	Module Transmitter Ground
18	<i>CML-I</i>	<i>TD+</i>	Transmitter Non-Inverted Data Input
19	<i>CML-I</i>	<i>TD-</i>	Transmitter Inverted Data Input
20	-	<i>VeeT</i>	Module Transmitter Ground

Application Notes

Electrical Interface: All signal interfaces are compliant with the SFP+ MSA specification. The high speed DATA interface is differential AC-coupled internally and can be directly connected to a 3.3V SERDES IC. All low speed control and sense output signals are open collector TTL compatible and should be pulled up with a 4.7k Ω - 10k Ω resistor on the host board.

Loss of Signal (LOS): The Loss of Signal circuit monitors the level of the incoming optical signal and generates logic HIGH when an insufficient photocurrent is produced.

TX_Fault: The output indicates LOW when the transmitter is operating normally and HIGH with a laser fault including laser end-of-life. TX Fault is an open collector/drain output and should be pulled up with a 4.7k Ω - 10k Ω resistor on the host board.

TX_Disable: When the TX Disable pin is at logic HIGH, the transmitter optical output is disabled. The laser is also disabled if this line is left floating, as it is pulled high inside the transceiver.

Serial Identification and Monitoring: The module definition of SFP is indicated by the MOD_ABS pin and the

2-wire serial interface. Upon power up, the 2-wire interface appears as NC (no connection), and MOD_ABS is TTL LOW. When the host system detects this condition, it activates the serial protocol (standard two-wire I²C serial interface) and generates the serial clock signal (SCL). The positive edge clocks data into the EEPROM segments of the device that are not write protected, and the negative edge clocks data from the device. The serial data signal (SDA) is for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The supported monitoring functions are temperature, voltage, bias current, transmitter power, average receiver signal, all alarms and warnings, and software monitoring of TX Fault/LOS. The device is internally calibrated.

The data transfer protocol and the details of the mandatory and vendor specific data structures are defined in the SFP MSA, and SFF-8472, Rev. 10.4.

Power Supply and Grounding: The power supply line should be well-filtered. All power supply bypass capacitors should be as close to the transceiver module as possible.

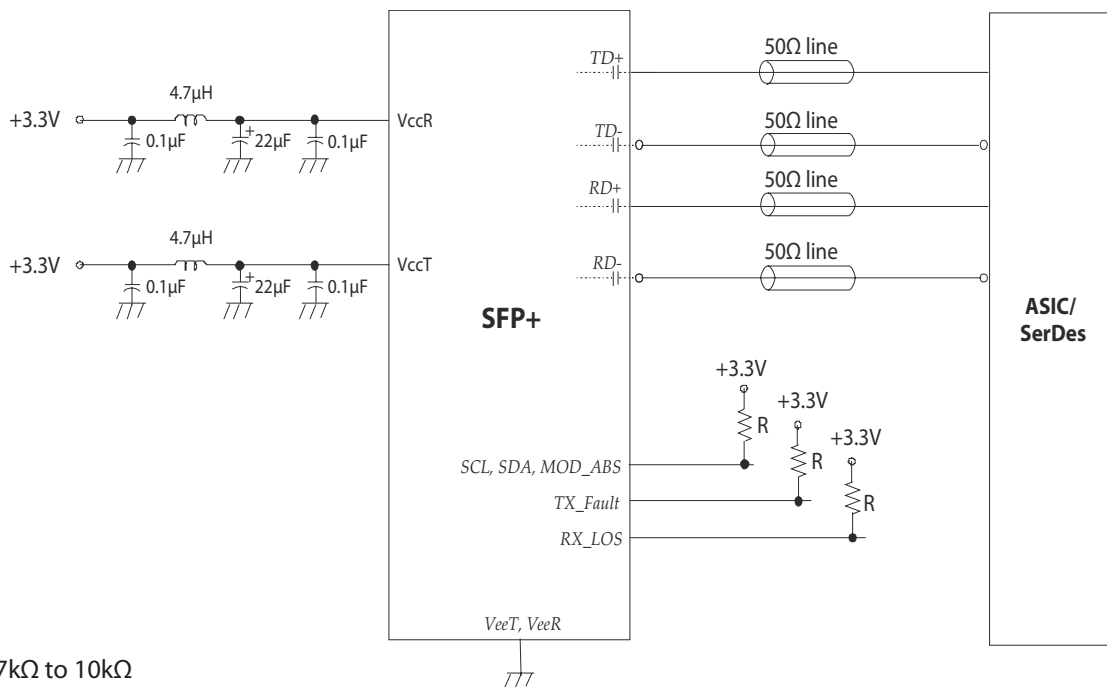
Interfacing the Transceivers

Communication is via a serial 2-wire serial interface. As described in the document SFF-8472 (REV. 10.4) there are two distinct address spaces:

Base Address A0(hex)	
Byte Address	Content
0 – 95	Serial Transceiver ID as defined in SFP MSA
96 – 127	OPLINK Specific
128 – 255	Reserved

Base Address A2(hex)	
Byte Address	Content
0 - 55	Alarm & Warnings thresholds & limits
56 - 95	External calibration constants (not used)
96 – 119	Values from real time diagnostic monitoring
120 – 127	Not used
128 – 247	Customer specific, writable area
248 - 255	Not used

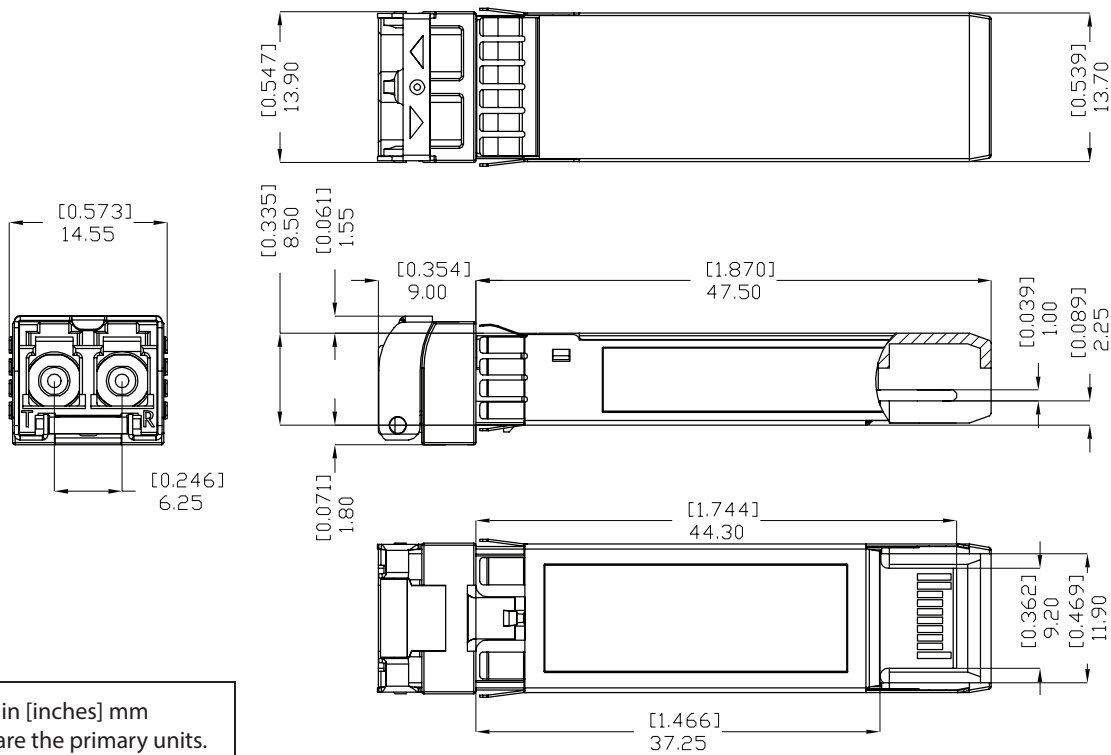
Application Schematics Recommended electrical connections to transceiver are shown below.



ESD & Electromagnetic Compatibility

Requirements	Standard	Status
Electro Static Discharge to the Electrical Pins (ESD)	EIA/JESD22-A114-B MIL-STD 883C Method 3015.7	Exceeds requirements Class 1B (>1000V)
Immunity to ESD (housing, receptacle)	IEN 61000-4-2	Exceeds requirements Discharges ranging from 2kV to 15kV without damages to the transceiver
Electromagnetic Emission (EMI)	FCC Part 15, Class B EN 55022 Class B CISPR 22	Exceeds requirements Class B

Package Outline



Dimensions in [inches] mm
 Millimeters are the primary units.
 Tolerances are in accordance with
 SFF-8432 Rev.5

Ordering Information

Oplink can provide a remarkable range of customized optical solutions. For detail, please contact Oplink's Sales and Marketing for your requirements and ordering information (510) 933-7200 or Sales@oplink.com.

Model Name	Operating Temperature		Center Wavelength (nm)	ITU Frequency (THz)	Wavelength Reference	Distance
TPD1XGKZRC00061G	- 5°C to +70°C	Commercial	1528.77	196.1	61	80km
TPD1XGKZRC00060G	- 5°C to +70°C	Commercial	1529.55	196.0	60	80km
TPD1XGKZRC00059G	- 5°C to +70°C	Commercial	1530.33	195.9	59	80km
TPD1XGKZRC00058G	- 5°C to +70°C	Commercial	1531.12	195.8	58	80km
TPD1XGKZRC00057G	- 5°C to +70°C	Commercial	1531.90	195.7	57	80km
TPD1XGKZRC00056G	- 5°C to +70°C	Commercial	1532.68	195.6	56	80km
TPD1XGKZRC00055G	- 5°C to +70°C	Commercial	1533.47	195.5	55	80km
TPD1XGKZRC00054G	- 5°C to +70°C	Commercial	1534.25	195.4	54	80km
TPD1XGKZRC00053G	- 5°C to +70°C	Commercial	1535.04	195.3	53	80km
TPD1XGKZRC00052G	- 5°C to +70°C	Commercial	1535.82	195.2	52	80km
TPD1XGKZRC00051G	- 5°C to +70°C	Commercial	1536.61	195.1	51	80km
TPD1XGKZRC00050G	- 5°C to +70°C	Commercial	1537.40	195.0	50	80km
TPD1XGKZRC00049G	- 5°C to +70°C	Commercial	1538.19	194.9	49	80km
TPD1XGKZRC00048G	- 5°C to +70°C	Commercial	1538.98	194.8	48	80km
TPD1XGKZRC00047G	- 5°C to +70°C	Commercial	1539.77	194.7	47	80km
TPD1XGKZRC00046G	- 5°C to +70°C	Commercial	1540.56	194.6	46	80km
TPD1XGKZRC00045G	- 5°C to +70°C	Commercial	1541.35	194.5	45	80km

Model Name	Operating Temperature		Center Wavelength (nm)	ITU Frequency (THz)	Wavelength Reference	Distance
TPD1XGKZRC00044G	- 5°C to +70°C	Commercial	1542.14	194.4	44	80km
TPD1XGKZRC00043G	- 5°C to +70°C	Commercial	1542.94	194.3	43	80km
TPD1XGKZRC00042G	- 5°C to +70°C	Commercial	1543.73	194.2	42	80km
TPD1XGKZRC00041G	- 5°C to +70°C	Commercial	1544.53	194.1	41	80km
TPD1XGKZRC00040G	- 5°C to +70°C	Commercial	1545.32	194.0	40	80km
TPD1XGKZRC00039G	- 5°C to +70°C	Commercial	1546.12	193.9	39	80km
TPD1XGKZRC00038G	- 5°C to +70°C	Commercial	1546.92	193.8	38	80km
TPD1XGKZRC00037G	- 5°C to +70°C	Commercial	1547.72	193.7	37	80km
TPD1XGKZRC00036G	- 5°C to +70°C	Commercial	1548.51	193.6	36	80km
TPD1XGKZRC00035G	- 5°C to +70°C	Commercial	1549.32	193.5	35	80km
TPD1XGKZRC00034G	- 5°C to +70°C	Commercial	1550.12	193.4	34	80km
TPD1XGKZRC00033G	- 5°C to +70°C	Commercial	1550.92	193.3	33	80km
TPD1XGKZRC00032G	- 5°C to +70°C	Commercial	1551.72	193.2	32	80km
TPD1XGKZRC00031G	- 5°C to +70°C	Commercial	1552.52	193.1	31	80km
TPD1XGKZRC00030G	- 5°C to +70°C	Commercial	1553.33	193.0	30	80km
TPD1XGKZRC00029G	- 5°C to +70°C	Commercial	1554.13	192.9	29	80km
TPD1XGKZRC00028G	- 5°C to +70°C	Commercial	1554.94	192.8	28	80km
TPD1XGKZRC00027G	- 5°C to +70°C	Commercial	1555.75	192.7	27	80km
TPD1XGKZRC00026G	- 5°C to +70°C	Commercial	1556.55	192.6	26	80km
TPD1XGKZRC00025G	- 5°C to +70°C	Commercial	1557.36	192.5	25	80km
TPD1XGKZRC00024G	- 5°C to +70°C	Commercial	1558.17	192.4	24	80km
TPD1XGKZRC00023G	- 5°C to +70°C	Commercial	1558.98	192.3	23	80km
TPD1XGKZRC00022G	- 5°C to +70°C	Commercial	1559.79	192.2	22	80km
TPD1XGKZRC00021G	- 5°C to +70°C	Commercial	1560.61	192.1	21	80km
TPD1XGKZRC00020G	- 5°C to +70°C	Commercial	1561.42	192.0	20	80km
TPD1XGKZRC00019G	- 5°C to +70°C	Commercial	1562.23	191.9	19	80km
TPD1XGKZRC00018G	- 5°C to +70°C	Commercial	1563.05	191.8	18	80km
TPD1XGKZRC00017G	- 5°C to +70°C	Commercial	1563.86	191.7	17	80km
TPD1XGKZRC00016G	- 5°C to +70°C	Commercial	1564.68	191.6	16	80km

Model Name	Operating Temperature		Center Wavelength (nm)	ITU Frequency (THz)	Wavelength Reference	Distance
TPD1XGKZRE00061G	- 5°C to +85°C	Extended	1528.77	196.1	61	80km
TPD1XGKZRE00060G	- 5°C to +85°C	Extended	1529.55	196.0	60	80km
TPD1XGKZRE00059G	- 5°C to +85°C	Extended	1530.33	195.9	59	80km
TPD1XGKZRE00058G	- 5°C to +85°C	Extended	1531.12	195.8	58	80km
TPD1XGKZRE00057G	- 5°C to +85°C	Extended	1531.90	195.7	57	80km
TPD1XGKZRE00056G	- 5°C to +85°C	Extended	1532.68	195.6	56	80km
TPD1XGKZRE00055G	- 5°C to +85°C	Extended	1533.47	195.5	55	80km
TPD1XGKZRE00054G	- 5°C to +85°C	Extended	1534.25	195.4	54	80km
TPD1XGKZRE00053G	- 5°C to +85°C	Extended	1535.04	195.3	53	80km
TPD1XGKZRE00052G	- 5°C to +85°C	Extended	1535.82	195.2	52	80km
TPD1XGKZRE00051G	- 5°C to +85°C	Extended	1536.61	195.1	51	80km

Model Name	Operating Temperature		Center Wavelength (nm)	ITU Frequency (THz)	Wavelength Reference	Distance
TPD1XGKZRE00050G	- 5°C to +85°C	Extended	1537.40	195.0	50	80km
TPD1XGKZRE00049G	- 5°C to +85°C	Extended	1538.19	194.9	49	80km
TPD1XGKZRE00048G	- 5°C to +85°C	Extended	1538.98	194.8	48	80km
TPD1XGKZRE00047G	- 5°C to +85°C	Extended	1539.77	194.7	47	80km
TPD1XGKZRE00046G	- 5°C to +85°C	Extended	1540.56	194.6	46	80km
TPD1XGKZRE00045G	- 5°C to +85°C	Extended	1541.35	194.5	45	80km
TPD1XGKZRE00044G	- 5°C to +85°C	Extended	1542.14	194.4	44	80km
TPD1XGKZRE00043G	- 5°C to +85°C	Extended	1542.94	194.3	43	80km
TPD1XGKZRE00042G	- 5°C to +85°C	Extended	1543.73	194.2	42	80km
TPD1XGKZRE00041G	- 5°C to +85°C	Extended	1544.53	194.1	41	80km
TPD1XGKZRE00040G	- 5°C to +85°C	Extended	1545.32	194	40	80km
TPD1XGKZRE00039G	- 5°C to +85°C	Extended	1546.12	193.9	39	80km
TPD1XGKZRE00038G	- 5°C to +85°C	Extended	1546.92	193.8	38	80km
TPD1XGKZRE00037G	- 5°C to +85°C	Extended	1547.72	193.7	37	80km
TPD1XGKZRE00036G	- 5°C to +85°C	Extended	1548.51	193.6	36	80km
TPD1XGKZRE00035G	- 5°C to +85°C	Extended	1549.32	193.5	35	80km
TPD1XGKZRE00034G	- 5°C to +85°C	Extended	1550.12	193.4	34	80km
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TPD1XGKZRE00031G	- 5°C to +85°C	Extended	1552.52	193.1	31	80km
TPD1XGKZRE00030G	- 5°C to +85°C	Extended	1553.33	193	30	80km
TPD1XGKZRE00029G	- 5°C to +85°C	Extended	1554.13	192.9	29	80km
TPD1XGKZRE00028G	- 5°C to +85°C	Extended	1554.94	192.8	28	80km
TPD1XGKZRE00027G	- 5°C to +85°C	Extended	1555.75	192.7	27	80km
TPD1XGKZRE00026G	- 5°C to +85°C	Extended	1556.55	192.6	26	80km
TPD1XGKZRE00025G	- 5°C to +85°C	Extended	1557.36	192.5	25	80km
TPD1XGKZRE00024G	- 5°C to +85°C	Extended	1558.17	192.4	24	80km
TPD1XGKZRE00023G	- 5°C to +85°C	Extended	1558.98	192.3	23	80km
TPD1XGKZRE00022G	- 5°C to +85°C	Extended	1559.79	192.2	22	80km
TPD1XGKZRE00021G	- 5°C to +85°C	Extended	1560.61	192.1	21	80km
TPD1XGKZRE00020G	- 5°C to +85°C	Extended	1561.42	192	20	80km
TPD1XGKZRE00019G	- 5°C to +85°C	Extended	1562.23	191.9	19	80km
TPD1XGKZRE00018G	- 5°C to +85°C	Extended	1563.05	191.8	18	80km
TPD1XGKZRE00017G	- 5°C to +85°C	Extended	1563.86	191.7	17	80km
TPD1XGKZRE00016G	- 5°C to +85°C	Extended	1564.68	191.6	16	80km

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TPD1XGKZRI00054G	-40°C to +85°C	Industrial	1534.25	195.4	54	80km
TPD1XGKZRI00053G	-40°C to +85°C	Industrial	1535.04	195.3	53	80km
TPD1XGKZRI00052G	-40°C to +85°C	Industrial	1535.82	195.2	52	80km
TPD1XGKZRI00051G	-40°C to +85°C	Industrial	1536.61	195.1	51	80km
TPD1XGKZRI00050G	-40°C to +85°C	Industrial	1537.40	195.0	50	80km
TPD1XGKZRI00048G	-40°C to +85°C	Industrial	1538.98	194.8	48	80km
TPD1XGKZRI00049G	-40°C to +85°C	Industrial	1538.19	194.9	49	80km
TPD1XGKZRI00047G	-40°C to +85°C	Industrial	1539.77	194.7	47	80km
TPD1XGKZRI00046G	-40°C to +85°C	Industrial	1540.56	194.6	46	80km
TPD1XGKZRI00045G	-40°C to +85°C	Industrial	1541.35	194.5	45	80km
TPD1XGKZRI00044G	-40°C to +85°C	Industrial	1542.14	194.4	44	80km
TPD1XGKZRI00043G	-40°C to +85°C	Industrial	1542.94	194.3	43	80km
TPD1XGKZRI00042G	-40°C to +85°C	Industrial	1543.73	194.2	42	80km
TPD1XGKZRI00041G	-40°C to +85°C	Industrial	1544.53	194.1	41	80km
TPD1XGKZRI00040G	-40°C to +85°C	Industrial	1545.32	194.0	40	80km
TPD1XGKZRI00039G	-40°C to +85°C	Industrial	1546.12	193.9	39	80km
TPD1XGKZRI00038G	-40°C to +85°C	Industrial	1546.92	193.8	38	80km
TPD1XGKZRI00037G	-40°C to +85°C	Industrial	1547.72	193.7	37	80km
TPD1XGKZRI00036G	-40°C to +85°C	Industrial	1548.51	193.6	36	80km
TPD1XGKZRI00035G	-40°C to +85°C	Industrial	1549.32	193.5	35	80km
TPD1XGKZRI00034G	-40°C to +85°C	Industrial	1550.12	193.4	34	80km
TPD1XGKZRI00033G	-40°C to +85°C	Industrial	1550.92	193.3	33	80km
TPD1XGKZRI00032G	-40°C to +85°C	Industrial	1551.72	193.2	32	80km
TPD1XGKZRI00031G	-40°C to +85°C	Industrial	1552.52	193.1	31	80km
TPD1XGKZRI00030G	-40°C to +85°C	Industrial	1553.33	193.0	30	80km
TPD1XGKZRI00029G	-40°C to +85°C	Industrial	1554.13	192.9	29	80km
TPD1XGKZRI00028G	-40°C to +85°C	Industrial	1554.94	192.8	28	80km
TPD1XGKZRI00027G	-40°C to +85°C	Industrial	1555.75	192.7	27	80km
TPD1XGKZRI00026G	-40°C to +85°C	Industrial	1556.55	192.6	26	80km
TPD1XGKZRI00025G	-40°C to +85°C	Industrial	1557.36	192.5	25	80km
TPD1XGKZRI00024G	-40°C to +85°C	Industrial	1558.17	192.4	24	80km
TPD1XGKZRI00023G	-40°C to +85°C	Industrial	1558.98	192.3	23	80km
TPD1XGKZRI00022G	-40°C to +85°C	Industrial	1559.79	192.2	22	80km
TPD1XGKZRI00021G	-40°C to +85°C	Industrial	1560.61	192.1	21	80km
TPD1XGKZRI00020G	-40°C to +85°C	Industrial	1561.42	192.0	20	80km
TPD1XGKZRI00019G	-40°C to +85°C	Industrial	1562.23	191.9	19	80km
TPD1XGKZRI00018G	-40°C to +85°C	Industrial	1563.05	191.8	18	80km
TPD1XGKZRI00017G	-40°C to +85°C	Industrial	1563.86	191.7	17	80km
TPD1XGKZRI00016G	-40°C to +85°C	Industrial	1564.68	191.6	16	80km

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